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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/656,092	09/06/2000	Joseph Nathan Mitchell	090936.0443	8849

31625 7590 10/09/2002

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EXAMINER
KNAUSS, SCOTT A

ART UNIT	PAPER NUMBER
2874	

DATE MAILED: 10/09/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/656,092	MITCHELL ET AL.	
	Examiner	Art Unit	
	Scott A Knauss	2874	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 July 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4-9,17,20-24 and 31-42* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *17,20-24,33 and 34* is/are allowed.

6)☒ Claim(s) *1,5,8,9,31,32,35-37 and 39-42* is/are rejected.

7)☒ Claim(s) *4,6,7 and 38* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 7/30/02 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1,5,8,9,31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,445,840 to Fan et al.

Regarding claim 1 Fan discloses in figures 15 and 1a

an optical switching system comprising arrays (#1530, #1520) of stationary optical fibers to conduct selected optical signals to a light beam receptor, in this case other optical fibers

an optical switch fabricated on a substrate (#1510) and having an array of movable reflective surfaces

Fan also discloses placing lenses at the end of each optical fiber, see especially figs. 9b and 11a, and also discloses fibers arranged around the perimeter of the substrate of the optical switch.

Fan additionally discloses the use of a bimorph actuator (see column 7, lines 48-56), which comprises a sandwich of two layers of materials having different expansion properties. Since the layers can also be thought of as cantilevered "arms", Fan thus discloses an arm (which would inherently be attached to the substrate in some manner), with a surface having a layer of material with a different thermal expansion property on at least a portion of a surface of an arm.

Fan does not explicitly disclose, however, how each reflective surface would be attached to such an actuator. Nevertheless, Fan does, however disclose in fig. 17 attaching a mirror (#1720) to the free end of a single actuator such that it is substantially perpendicular to a substrate for the purpose of reflecting signals in an optical switch.

Therefore it would have been obvious to one of ordinary skill in the art to attach a mirror in the same way to a bimorph actuator for the purpose of thermally actuating a movable mirror in an optical switch.

Regarding claim 5, Fan does not specify the materials from which the arms of the actuators are made, in particular the materials listed in claim 5. Nevertheless, such materials are well known in the manufacture of thermal actuators, and it would have been obvious to one of ordinary skill in the art to incorporate such materials to produce arms capable of thermal actuation.

Regarding claim 8 Fan discloses the use of metals to form layers in the actuator (see column 7, line 52)

Regarding claim 9 Fan discloses a bimorph actuator which would inherently possess arms which would be spaced from the substrate by an extension of the arm, at the part where the arm is attached to a mirror.

Regarding claim 31, Fan discloses an thermal bimorph actuator which bends in response to electrical or heat energy, thus moving a reflective surface into the path of a light beam to deflect the beam to a receptor.

Regarding claim 32, Fan, as modified above, possesses a mirror which would be rigidly attached to the arm.

5. Claims 35-37 and 39-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fan et al. in view of US 6,275,325 to Sinclair.

Fan, as stated above, discloses a thermally actuated switch having a substrate, and array of reflective surfaces and a plurality of cantilever actuators. However, Fan does not discloses the use of a pair of arms having a common free end, instead disclosing a sandwich of two layers having different thermal expansion properties.

Fan does not explicitly disclose, however, how each reflective surface would be attached to such an actuator. Nevertheless, Fan does, however disclose in fig. 17 attaching a mirror (#1720) to the free end of a single actuator such that it is substantially perpendicular to a substrate for the purpose of reflecting signals in an optical switch, and it would have been obvious to one of ordinary skill in the art to attach a mirror in the same way to the end of a bimorph actuator for the purpose of thermally actuating a movable mirror in an optical switch.

Sinclair, on the other hand, discloses a similar type of thermal actuator in figure 20, incorporating a pair of arms having a common fixed end, for the purpose of producing motion in a direction perpendicular to a substrate.

Therefore it would have been obvious to one of ordinary skill in the art to incorporate the pair of arms disclosed by Sinclair in the optical switch disclosed by Fan by attaching a reflective surface in same manner as discussed above to the common fixed end of the actuator for the purpose of actuating a mirror in a direction perpendicular to a substrate.

Regarding claim 36, Sinclair discloses a pair of arms, but does not explicitly disclose using different widths for each arm.

Sinclair does, however, state that differences in the thermal properties of each arm may be produced by differences in the arms cross-sectional area (see column 2, lines 56-65).

Therefore it would have been a matter of routine experimentation to one of ordinary skill in the art to vary parameters affecting the cross sectional area of each of

the arms, including varying the thickness of each of the arms, to produce a desired thermal expansion property in each of the arms, thus enabling the actuator to bend in a desired direction.

Regarding claim 37, Sinclair discloses in fig. 20 arms having different lengths, one located under the other.

Regarding claim 39, Fan, as modified by Sinclair, discloses reflective surfaces which are attached to actuating arms such that they are perpendicular to a substrate.

Regarding claims 40 and 42, Sinclair further discloses a thermal actuator comprising an arm comprising a material with a first coefficient of thermal expansion (#226, column 2, lines 34-40) and a material with a second coefficient of thermal expansion (#224, column 2, lines 34-40), which may be polysilicon (see column 2, lines 56-65)

Regarding claim 41 Fan, as modified by Sinclair, discloses a bimorph actuator which would inherently possess arms which would be spaced from the substrate by an extension of the arm, at the part where the arm is attached to a mirror.

Allowable Subject Matter

6. Claims 17,20-24,33 and 34 are allowed. Regarding claim 17 in particular, prior art fails to disclose a thermally actuated optical switch having a plurality of cantilever thermal actuators, each actuator having an arm with a first thermal expansion property and having a layer of material having a second thermal expansion property on a portion of the upper and lower surfaces of the arm.

Claims 4,6,7 and 38 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Regarding claim 4 prior art fails to discloses a cantilevered thermally actuated switch having an air gap within an arm.

Regarding claims 6 and 7 prior art fails to disclose a cantilevered thermally actuated switch having layers on each of the top and bottom surface of an arm.

Regarding claim 38, prior art fails to disclose a thermally operated optical switch comprising a plurality of cantilevered actuators, each having a pair of arms, the pair of arms having a common free end to which an associated reflective surface is rigidly attached, each reflective surface having a single associated actuator, wherein each reflective surface is attached so that it is parallel to a substrate.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patent Application 2002/0106834 to Chiu et al. discloses another example of using cantilevered arms to actuate an optical switch, as does U.S. Patent No. 6,438,954 to Goetz et al.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott A Knauss whose telephone number is (703) 305-5043. The examiner can normally be reached on 9-6 Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney Bovernick can be reached on (703) 308 - 4819. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9317 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0530.

Scott Knauss

Art Unit 2874

sak
September 23, 2002

HEMANG SANGHAVI
PRIMARY EXAMINER